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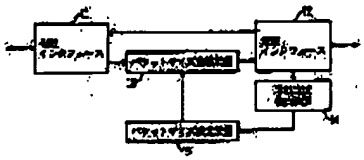
(54) RADIO PACKET TRANSMISSION SYSTEM

(57)Abstract:
PROBLEM TO BE SOLVED: To improve the throughput of the entire system by deciding an optimum size of a radio packet in response to a mobile speed of a radio packet transmission terminal and revising the original size of the packet so as to minimize a frequency of packet re-transmission and a time required for re- transmission of the packet.
SOLUTION: A mobile speed detection circuit 14 detects a current mobile speed of a radio packet transmission terminal based on information obtained directly or via a radio interface 12 or a wired interface 11. A packet size decision device 15 stores an optimum packet size with respect to the mobile speed and decides a size of a packet corresponding to a detected mobile speed based thereon. A packet size converter 13 changes a size of a packet received from the wired interface 11. The packet whose size is converted is given to a radio interface 12, where the packet is converted into a radio packet and transmitted.



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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] It connects with the connectionless network using the TCP/IP protocol group etc., and this invention relates to the radio packet transmission equipment which transmits a radio packet.
[0002] In addition, with the radio packet transmission equipment in this specification, the both sides of a radio packet transmission terminal unit and radio packet transmission base station equipment shall be included.
[0003]
[Description of the Prior Art] Drawing 7 shows the example of composition of the network which used radio packet transmission equipment. In drawing, a radio packet transmission terminal unit functions as a part of network where it connects with the cable interface (LAN, such as Ethernet and OCN) 72 or the information terminal (a workstation (WS), a personal computer (PC), Personal Digital Assistant (PDA)) 73, and 71 uses a TCP/IP protocol group etc. It connects with the cable network 75, and radio packet transmission base station equipment 74 functions as a network device which uses a TCP/IP protocol group etc., and transmits and receives a radio packet among two or more radio packet transmission terminal units 71 which exist in each cell.
[0004] If it moves to the cell which adjoins from a cell with the radio packet transmission terminal unit 71, the hand over which changes the belonging radio packet transmission base station equipment 74 will be performed. If packet transmission is performed between the radio packet transmission terminal unit 71 and radio packet transmission base station equipment 74 at this time, the packet under transmission is discarded, and packet transmission will be resumed after hand exaggerated processing is completed.
[0005] Drawing 8 shows the example of composition of conventional radio packet transmission equipment. In drawing, the cable interface 81 and the radio interface 82 are linked directly. The cable interface 81 transmits and receives a packet between LAN72 or the information terminal 73. The packet which received with the cable interface 81 is sent to the radio interface 82 with the same packet size. The radio interface 82 transmits and receives a radio packet among other radio packet transmission equipments through a radio circuit. The packet which received with the radio interface 82 is changed and transmitted to the cable packet of the same packet size from the cable interface 81.
[0006]
[Problem(s) to be Solved by the Invention] With conventional radio packet transmission equipment, it has composition transmitted from the radio interface 82 with the packet size inputted into the cable interface 81. Therefore, when a packet size is large, hand over is encountered into packet transmission and the cases which the packet under transmission is discarded and are resent also increase in number. Furthermore, since the packet size resent is also large, the time concerning resending becomes long. Consequently, file transfer time becomes long, and when hand over occurs frequently, a throughput will fall remarkably.
[0007] this invention stops the time concerning the packet resending frequency and packet resending by hand over to the minimum, and aims at offering the radio packet transmission equipment which can raise a system-wide throughput.

[0008]
[Means for Solving the Problem] The radio packet transmission equipment of this invention determines the optimal packet size of a radio packet according to the traverse speed of a radio packet transmission terminal unit, and changes a packet size by packet division etc. Moreover, a hand exaggerated time interval may be presumed from the traverse speed or the traverse speed, and the move direction of a radio packet transmission terminal unit, and a packet size may be determined according to it. By this, the packet size of a radio packet can be optimized, the packet abandonment under transmission by hand over can decrease, and packet resending frequency can be reduced. Furthermore, even if it becomes packet resending by packet abandonment by hand over, the time concerning resending can be shortened.
[0009]
[Embodiments of the Invention] (1st operation gestalt) Drawing 1 shows the 1st operation gestalt of the radio packet transmission equipment of this invention. The composition of this operation gestalt is applied to the both sides of a radio packet transmission terminal unit and radio packet transmission base station equipment.
[0010] In drawing, the cable interface 11 transmits and receives a TCP/IP packet between the cable networks or information terminals which were connected. The packet which received with the cable interface 11 is sent to the radio interface 12 through the packet size inverter 13. The radio interface 12 transmits and receives a radio packet between the radio packet transmission equipment which counters through a radio circuit. The packet which received with the radio interface 12 is sent to the cable interface 11 as it is.
[0011] Traverse-speed detection equipment 14 detects the present traverse speed of a radio packet transmission terminal unit from the information acquired from the direct or radio interface 12 or the cable interface 11. Here, the example connected to the radio interface 12 is shown. For example, traverse speed is detected from the maximum Doppler frequency which presumed and presumed the maximum Doppler frequency from the error rate obtained from the radio interface 12, or receiving level variation, and a carrier frequency. Packet size determination equipment 15 memorizes the optimal packet size to traverse speed beforehand, determines the packet size corresponding to the traverse speed detected based on it, and notifies it to the packet size inverter 13.
[0012] The packet size inverter 13 changes the packet size of the packet inputted from the cable interface 11 based on the determined packet size. The packet from which the packet size was changed is inputted into the radio interface 12, and is transmitted to the radio packet transmission equipment which changes and counters a radio packet.
[0013] The simulation which asks for the optimal packet size to the traverse speed of a radio packet transmission terminal unit here is explained. Simulation conditions are a file size. 2-M byte transfer rate 32 kbit/s (4 K bytes/(s))
Cell configuration Square cell size 200mx200m traverse speed 10, 20, 40, 80, 160 m/s packet size They could be 1500, 1000, 750, 500, 250, and 100 bytes. Moreover, radio packet transmission base station equipment is arranged at the center of a cell, and a radio packet transmission terminal unit moves at uniform velocity from the arbitrary points in a cell. Hand over is performed when moving to a contiguity cell from the cell concerned. When packet transmission is being carried out at the time of hand exaggerated generating, it resends, after moving to a contiguity cell.
[0014] Drawing 5 shows the traverse speed of a radio packet transmission terminal unit, and the relation of file transfer time. File transfer time is traverse speed 0, and was standardized by the file transfer time at the time of the packet size of 1500 bytes. A horizontal axis is the file transfer time which standardized traverse speed (m/s) and the vertical axis. The number in drawing shows a packet size.
[0015] For example, traverse speed When it is 160m/s, it is 1500 bytes of packet. When it divides and transmits to 500 bytes, it turns out that the transfer time can be shortened about 20% and a throughput improves. However, when it divides and transmits to 250 bytes, as shown in drawing 4 mentioned later, it turns out that file transfer time gets worse uniformly by the increase in the overhead by addition of a header compared with the case where it divides into 500 bytes.

[0016] Drawing 6 shows the traverse speed of a radio packet transmission terminal unit, and the relation of the optimal packet size. A horizontal axis is traverse speed (m/s) and a vertical axis is a packet size (byte). As shown here, it turns out that the optimal packet size exists to traverse speed. From this result, if the traverse speed of a radio packet transmission terminal unit is known, a packet size can be determined as a meaning.

[0017] (2nd operation gestalt) Drawing 2 shows the 2nd operation gestalt of the radio packet transmission equipment of this invention. The composition of this operation gestalt is applied to the both sides of a radio packet transmission terminal unit and radio packet transmission base station equipment.

[0018] In the composition of the 1st operation gestalt, the feature of this operation gestalt is equipped with the hand exaggerated prediction equipment 16 which predicts the time interval of hand over from the traverse speed of the radio packet transmission terminal unit detected with traverse-speed detection equipment 14, and is in the place where packet size determination equipment 17 determines the packet size corresponding to the hand exaggerated time interval. Other composition is the same as that of the 1st operation gestalt.

[0019] That is, hand exaggerated prediction equipment 16 inputs the detected traverse speed, and predicts the hand exaggerated time interval of a radio packet transmission terminal unit. Packet size determination equipment 17 memorizes the optimal packet size to a hand exaggerated time interval beforehand, determines the packet size corresponding to the hand exaggerated time interval predicted based on it, and notifies it to the packet size inverter 13. In addition, it can ask by the same simulation as the 1st operation gestalt also about the relation between a hand exaggerated time interval and the optimal packet size.

[0020] (3rd operation gestalt) Drawing 3 shows the 3rd operation gestalt of the radio packet transmission equipment of this invention. The composition of this operation gestalt is applied to radio packet transmission base station equipment.

[0021] In the 2nd operation gestalt, the feature of this operation gestalt is equipped with the move direction finding system 18 which detects the move direction of a radio packet transmission terminal unit, and is in the place where hand exaggerated prediction equipment 19 predicts a hand exaggerated time interval based on the traverse speed and the move direction of a radio packet transmission terminal unit. Other composition is the same as that of the 2nd operation gestalt.

[0022] That is, the move direction finding system 18 detects the present move direction of a radio packet transmission terminal unit from the information acquired from the radio interface 12. For example, the move direction of a radio packet transmission terminal unit is detectable with the direction presumption technology using array antennas. Hand exaggerated prediction equipment 19 inputs the traverse speed and the move direction which were detected, predicts the hand exaggerated time interval of a radio packet transmission terminal unit, and notifies it to packet size determination equipment 17.

[0023] Drawing 4 shows the composition of a packet, and an example of the packet size conversion method. A packet consists of a header 21 which has described packet classification, path information, etc., and a pay load 22 which has described data. Packet size conversion divides a pay load 22, and is performed by attaching the header of the original packet to each pay load. In the example of drawing 4, a pay load 22 is divided into two and the respectively same header 21 is attached to a pay load 22-1 and 22-2. The detailed explanation about the packet size conversion in IP is indicated by reference ("detailed explanation TCP/IP" W.R.Stevens work, Shoji Inoue supervision of translation, and Softbank Corp.).

[0024]

[Effect of the Invention] As explained above, by optimizing the packet size of a radio packet according to the traverse speed of a radio packet transmission terminal unit, the packet abandonment of radio packet transmission equipment (a radio packet transmission terminal unit and radio packet transmission base station equipment) of this invention under transmission by hand over can decrease, and it can reduce packet resending frequency. Furthermore, even if it becomes packet resending by packet abandonment by hand over, the time concerning resending can be shortened. Thereby, file transfer time becomes short and a high throughput can be realized.

[0025] Moreover, the precision of the optimal packet size can be raised by presuming a hand exaggerated time interval from the traverse speed of a radio packet transmission terminal unit, and determining a packet size according to it.
[0026] Moreover, with radio packet transmission base station equipment, the precision of the optimal packet size can be especially raised further by presuming a hand exaggerated time interval from the traverse speed and the move direction of a radio packet transmission terminal unit, and determining a packet size according to it.

[Translation done.]